

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents  
United States Patent and Trademark  
Office  
Box PCT  
Washington, D.C.20231  
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

<b>Date of mailing</b> (day/month/year) 17 March 2000 (17.03.00)	<b>Applicant's or agent's file reference</b> G PEM/MvZ/G5
<b>International application No.</b> PCT/NL99/00368	<b>Priority date</b> (day/month/year) 23 June 1998 (23.06.98)
<b>International filing date</b> (day/month/year) 14 June 1999 (14.06.99)	
<b>Applicant</b> GROBBENHAAR, Hermanus, Gerhardus	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:  
30 June 1999 (30.06.99)

☐ in a notice effecting later election filed with the International Bureau on:  
\_\_\_\_\_

2. The election ☒ was  
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

<p>The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No.: (41-22) 740.14.35</p>	<p>Authorized officer Claudio Borton</p> <p>Telephone No.: (41-22) 338.83.38</p>
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WO 99/67513  
PCT/NL99/00368

## PATENT COOPERATION TREATY

PCT

NOTICE INFORMING THE APPLICANT OF THE  
COMMUNICATION OF THE INTERNATIONAL  
APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

EVELEENS MAARSE, Pieter  
Arnold & Siedsma  
Sweelinckplein 101-070  
NL-2517 GK The Hague  
PAYS-BAS OKI

AGENDA:

23-1-00 ch F

Date of mailing (day/month/year) 29 December 1999 (29.12.99)		
Applicant's or agent's file reference GDEM/MvZ/G5		IMPORTANT NOTICE
International application No. PCT/NL99/00368	International filing date (day/month/year) 14 June 1999 (14.06.99)	Priority date (day/month/year) 23 June 1998 (23.06.98)
Applicant GRAND PRIX SILENCERS B.V. et al		

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:  
AU,CN,EP,IL,JP,KP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:  
AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CU,CZ,DE,DK,EA,EE,ES,FI,GB,GD,GE,GH,GM,HR,  
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The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 48.1(a-bis)).
3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on  
29 December 1999 (29.12.99) under No. WO 99/67513

## REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

## REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer J. Zahra
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

## PATENT COOPERATION TREATY

## PCT


## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 21 SEP 2000

WIPO

PCT

Applicant's or agent's file reference G PEM/MvZ/G2		<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/NL99/00368	International filing date (day/month/year) 14/06/1999	Priority date (day/month/year) 23/06/1998	
International Patent Classification (IPC) or national classification and IPC F01N3/28			
Applicant GRAND PRIX SILENCERS B.V. et al.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 3 sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li>I <input checked="" type="checkbox"/> Basis of the report</li> <li>II <input type="checkbox"/> Priority</li> <li>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li>IV <input type="checkbox"/> Lack of unity of invention</li> <li>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li>VI <input type="checkbox"/> Certain documents cited</li> <li>VII <input checked="" type="checkbox"/> Certain defects in the international application</li> <li>VIII <input type="checkbox"/> Certain observations on the international application</li> </ul>			
Date of submission of the demand  30/06/1999		Date of completion of this report  18.09.2000	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized officer  Zebst, M  Telephone No. +49 89 2399 7313	

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/NL99/00368

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**I. Basis of the report**

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

**Description, pages:**

1-8 as originally filed

**Claims, No.:**

1-11 as received on 28/06/2000 with letter of 26/06/2000

**Drawings, sheets:**

1/4-4/4 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/NL99/00368

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**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes:	Claims	1-11
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-11
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-11
	No:	Claims	

**2. Citations and explanations**

**see separate sheet**

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:

**see separate sheet**

**Re Item V**

Reference is made to the following document:

D1:US-A-5365735

**1. Claim 1**

**1.1. Novelty**

The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows (the references in parentheses applying to this document):

*a **catalytic converter unit** (20) received between a first and a second exhaust section (22,36) of an exhaust of an internal combustion engine, wherein the first exhaust section (22) is fit for connection to said internal combustion engine (column 3, lines 37-43; figure 3), **comprising**:*

- a catalytic converter housing (30) (figure 3);*
- a catalytic converter element (32) arranged in the catalytic converter housing (30) (figure 3);*
- a first connecting piece arranged between the first exhaust section (22) and the catalytic converter housing (30) and a second connecting piece arranged between the second exhaust section (36) and the catalytic converter housing (30) (figure 3): the meaning of the term "connecting piece" is too broad that the skilled man can say that the "first and the second connecting pieces" can be seen as two distinct pieces, but more as "parts" of the "catalytic converter housing (30)",*  
*wherein the first exhaust section (22) comprises at least two channels which are separated by a first separating element (26,28) (column 3, lines 64-68; column 4, lines 20-38; figure 3),*  
*the catalytic converter element (32) is divided in longitudinal direction into a number of parts corresponding with the number of channels (34a,34b), which parts are separated by at least a second separating element (48) aligned relative to the first separating element (28): column 4, line 48-52, figure 3).*

The subject-matter of claim 1 differs from this known document D1 in that "*the second separating element extends from the catalytic converter element at the side of the first exhaust section into the first connecting piece*".

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/NL99/00368

The subject-matter of claim 1 is therefore novel (Article 33(2) PCT).

**1.2. Inventive step**

The problem to be solved by the present invention may be regarded as to prevent breakage from the converter element by the first separating element during expansion of the exhaust pieces.

No document of the search report shows us such a separating element extending from one side of the catalytic converter. Neither is this feature obvious for the skilled man in order to solve the technical problem.

Therefore, the solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT).

**2. Dependent claims**

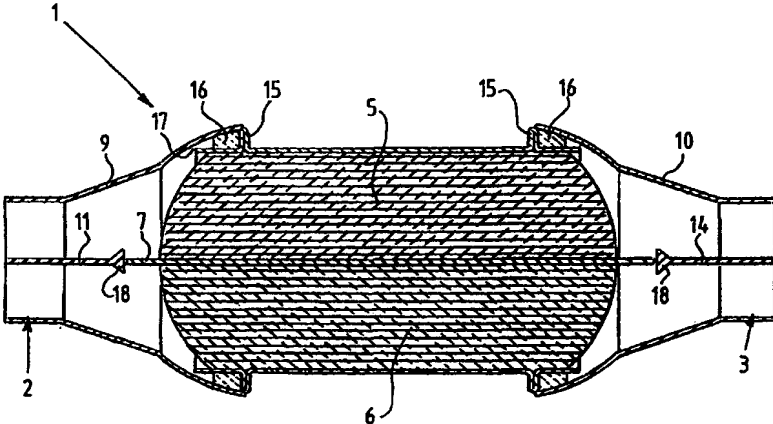
Claims 2 to 11 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

**Re Item VII**

1. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.
2. The description is not in conformity with the claims as required by Rule 5.1(a)(iii) PCT.



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>F01N 3/28, 7/18</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 99/67513</b> <b>(43) International Publication Date:</b> 29 December 1999 (29.12.99)
<b>(21) International Application Number:</b> PCT/NL99/00368 <b>(22) International Filing Date:</b> 14 June 1999 (14.06.99)  <b>(30) Priority Data:</b> 1009468                      23 June 1998 (23.06.98)                      NL  <b>(71) Applicant (for all designated States except US):</b> GRAND PRIX SILENCERS B.V. [NL/NL]; Konstruktieweg 3 + 3a, NL-6045 JD Roermond (NL).  <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> GROBBENHAAR, Her- manus, Gerhardus [NL/NL]; Stationsweg 82d, NL-6075 CD Herkenbosch (NL).  <b>(74) Agent:</b> EVELEENS MAARSE, Pieter; Arnold & Siedsma, Sweelinckplein 1, NL-2517 GK The Hague (NL).		<b>(81) Designated States:</b> AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>In English translation (filed in Dutch).</i>
<b>(54) Title:</b> IMPROVED CATALYSER HOUSING   <b>(57) Abstract</b> <p>The invention relates to a catalytic converter unit received between a first and a second exhaust section of an exhaust of an internal combustion engine, comprising: a catalytic converter housing; a catalytic converter element arranged in the catalytic converter housing; a first connecting piece arranged between the first exhaust section and the catalytic converter housing; and a second connecting piece arranged between the second exhaust section and the catalytic converter housing, wherein at least the first exhaust section comprises at least two channels which are separated by a first separating element, and wherein the catalytic converter element is divided in longitudinal direction into a number of parts corresponding with the number of channels, which parts are separated by at least a second separating element aligned relative to the first separating element. These measures enable separated supply to the catalytic converter, also in the case of exhaust systems with separate channels for the supply of exhaust gases from different cylinders or different groups of cylinders. The use of such a separating element prevents destruction of the catalytic converter element in the case of possible temperature stresses. The partitions used with such separated channels could after all crush such a ceramic catalytic converter element.</p>		



CLAIMS

1. Catalytic converter unit received between a  
5 first and a second exhaust section of an exhaust of an  
internal combustion engine, comprising:  
- a catalytic converter housing;  
- a catalytic converter element arranged in the  
catalytic converter housing;  
10 - a first connecting piece arranged between the  
first exhaust section and the catalytic converter  
housing; and  
- a second connecting piece arranged between  
the second exhaust section and the catalytic converter  
15 housing,

**characterized in that**

at least the first exhaust section comprises at  
least two channels which are separated by a first  
separating element,  
20 the catalytic converter element is divided in  
longitudinal direction into a number of parts  
corresponding with the number of channels, which parts  
are separated by at least a second separating element  
aligned relative to the first separating element.

25 2. Catalytic converter unit as claimed in claim  
1, **characterized in that** the first exhaust section  
comprises two channels of substantially equal cross-  
section, that the first separating element comprises a  
partition and that the second separating element  
30 comprises a plate separating two substantially identical  
parts of the catalytic converter element.

3. Catalytic converter unit as claimed in claim  
1, **characterized in that** the first exhaust section  
comprises an internal channel and two external channels  
35 of substantially C-shaped cross-section, wherein the  
cross-section of the C-shaped channels substantially  
equals double the cross-section of the internal channel,  
that the second separating element has a corresponding

cross-section and that the catalytic converter is divided into corresponding parts.

4. Catalytic converter unit as claimed in claim 1, 2 or 3, **characterized in that** a narrow gap is situated  
5 between the first separating element and the second separating element.

5. Catalytic converter unit as claimed in claim 1, 2 or 3, **characterized in that** the catalytic converter element is divided in transverse direction into at least  
10 two sections separated by an interspace and that the first separating element connects onto the second separating element.

6. Catalytic converter unit as claimed in any of the foregoing claims, **characterized in that** the  
15 catalytic converter element and the catalytic converter housing are separated by a spacer element extending around the catalytic converter unit.

7. Catalytic converter unit as claimed in claim 6, **characterized in that** the spacer element comprises a  
20 mat.

8. Catalytic converter unit as claimed in any of the foregoing claims, **characterized in that** rotation between the axis of the catalytic converter housing and the axis of at least the first exhaust section is  
25 possible on an axis extending transversely of one of these axes due to the connection between the first conical connecting piece and the catalytic converter housing, wherein the conical connecting piece on the outside of the catalytic converter housing is connected  
30 sealingly to the outside of the catalytic converter housing and wherein a gap is formed between the edge of the catalytic converter housing and the conical connecting piece.

9. Catalytic converter unit as claimed in claim  
35 8, **characterized in that** a shoulder is formed on the outside of the catalytic converter housing, a sealing ring is arranged against the outside of the shoulder,

wherein the first conical connecting piece rests against the sealing ring.

10. Catalytic converter unit as claimed in claim 8 or 9, **characterized in that** the first or the  
5 second separating element is provided on its edges at the side of the other separating element with a thickened portion which mutually separates the channels in a position of the catalytic converter housing relative to the exhaust section which varies from the normal  
10 position.

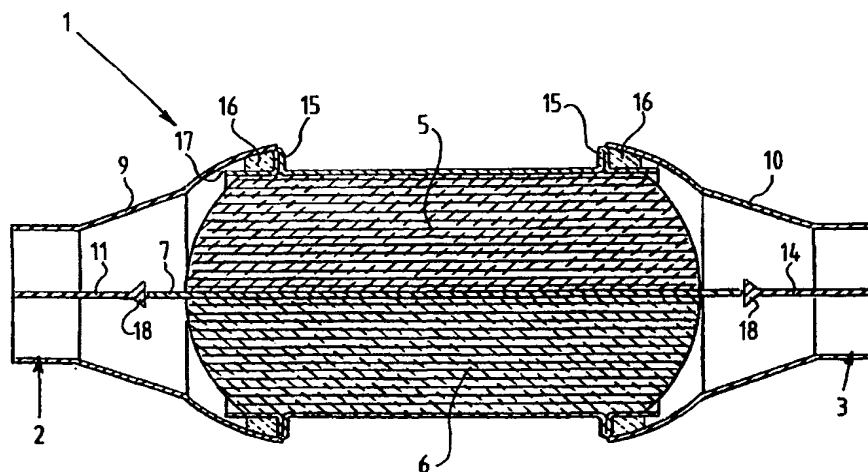
11. Catalytic converter unit as claimed in claim 10, **characterized in that** the catalytic converter housing is seam-folded at its ends around the spacer element.

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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>F01N 3/28, 7/18</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 99/67513</b> <b>(43) International Publication Date:</b> 29 December 1999 (29.12.99)
<b>(21) International Application Number:</b> PCT/NL99/00368 <b>(22) International Filing Date:</b> 14 June 1999 (14.06.99) <b>(30) Priority Data:</b> 1009468                      23 June 1998 (23.06.98)                      NL <b>(71) Applicant (for all designated States except US):</b> GRAND PRIX SILENCERS B.V. [NL/NL]; Konstruktieweg 3 + 3a, NL-6045 JD Roermond (NL). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> GROBBENHAAR, Her- manus, Gerhardus [NL/NL]; Stationsweg 82d, NL-6075 CD Herkenbosch (NL). <b>(74) Agent:</b> EVELEENS MAARSE, Pieter; Arnold & Siedsma, Sweelinckplein 1, NL-2517 GK The Hague (NL).		<b>(81) Designated States:</b> AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>In English translation (filed in Dutch).</i>

**(54) Title:** IMPROVED CATALYSER HOUSING**(57) Abstract**

The invention relates to a catalytic converter unit received between a first and a second exhaust section of an exhaust of an internal combustion engine, comprising: a catalytic converter housing; a catalytic converter element arranged in the catalytic converter housing; a first connecting piece arranged between the first exhaust section and the catalytic converter housing; and a second connecting piece arranged between the second exhaust section and the catalytic converter housing, wherein at least the first exhaust section comprises at least two channels which are separated by a first separating element, and wherein the catalytic converter element is divided in longitudinal direction into a number of parts corresponding with the number of channels, which parts are separated by at least a second separating element aligned relative to the first separating element. These measures enable separated supply to the catalytic converter, also in the case of exhaust systems with separate channels for the supply of exhaust gases from different cylinders or different groups of cylinders. The use of such a separating element prevents destruction of the catalytic converter element in the case of possible temperature stresses. The partitions used with such separated channels could after all crush such a ceramic catalytic converter element.

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EE	Estonia						

**IMPROVED CATALYSER HOUSING**

5           The present invention relates to a catalytic converter unit received between a first and a second exhaust section of an exhaust of an internal combustion engine, comprising a catalytic converter housing, a catalytic converter element arranged in the catalytic  
10 converter housing; a first connecting piece arranged between the first exhaust section and the catalytic converter housing; and a second connecting piece arranged between the second exhaust section and the catalytic converter housing.

15           Such catalytic converter units are generally known. At present use is usually made of a metal as substrate for catalytic converter units, on which metal the catalytic materials are arranged. The substrate is provided with channels extending in longitudinal  
20 direction, on the inside of which said materials are arranged.

          When attempting to increase the effectiveness of such catalytic converter units it is important that the temperatures of the combustion gases are as high as  
25 possible; it is therefore important that the catalytic converter units are placed as close as possible to the engine. It is also important that the substrate can withstand high temperatures. Use is made for this purpose of a ceramic element. However, the ceramic material has  
30 the property that it is difficult to manufacture in dimensionally stable manner and that the material is brittle, breaks easily and has a different thermal coefficient of expansion than the metals commonly used in this art.

35           The object of the present invention is therefore to provide such a catalytic converter unit, the construction of which is suitable for the use of catalytic converter substrates of ceramic material.

This objective is achieved in that at least the first exhaust section comprises at least two channels which are separated by a first separating element, that the catalytic converter element is divided in the longitudinal direction into a number of parts corresponding with the number of channels, which parts are separated by at least a second separating element aligned relative to the first separating element.

These measures enable separated supply to the catalytic converter, also in the case of exhaust systems with separate channels for the supply of exhaust gases from different cylinders or different groups of cylinders. The use of such a separating element prevents destruction of the catalytic converter element in the case of possible temperature stresses. The partitions used with such separated channels could after all crush such a ceramic catalytic converter element.

Although, as stated above, the invention is mainly applicable in ceramic substrates of catalytic converters, it is not limited thereto; it is likewise applicable in other types of catalytic converter, for instance metal, or in the future perhaps plastic substrates.

As stated in claims 2 and 3, this measure is possible in diverse configurations. The use of a gap between the first separating element and the second separating element results in improved protection of the catalytic converter in the case of possible temperature expansion.

This advantage is enhanced further when the catalytic converter element is divided in transverse direction into at least two sections which are separated by an interspace and the first separating element connects onto the second separating element.

The feature that the catalytic converter element and the catalytic converter housing are separated by a spacer element extending around the catalytic

converter unit also provides protection for the catalytic converter unit if it should extend in radial direction.

As stated, it is important that the catalytic converter unit be placed as close as possible to the engine in respect of the then higher temperature of the exhaust gases. When the engine is started the catalytic converter then becomes effective sooner. In respect of engine vibration it is important that rotation between the axis of the catalytic converter housing and the axis of at least the first exhaust section is possible on an axis extending transversely of one of these axes due to the connection between the first conical connecting piece and the catalytic converter housing, wherein the conical connecting piece connected sealingly to the outside of the catalytic converter housing and wherein a gap is formed between the edge of the catalytic converter housing and the conical connecting piece.

According to a particular embodiment hereof a shoulder is formed on the outside of the catalytic converter housing, wherein a sealing ring is arranged against the outside of the shoulder, and the first conical connecting piece rests against the sealing ring. This is structurally a particularly attractive embodiment. Said gap not only enables a rotation but also enables mutual axial displacement of the of the elements without destroying the catalytic converter housing.

According to another preferred embodiment the first or the second separating element is provided on its edges at the side of the other separating element with a thickened portion which mutually separates the channels in a position of the catalytic converter housing relative to the exhaust section which varies from the normal position.

It will be apparent that this provides for situations in which rotation of the diverse components results and wherein the channels are nevertheless mutually separated.



The embodiment wherein the catalytic converter housing is seam-folded at its ends around the spacer element also results in an attractive, robust construction.

5           The present invention will be elucidated hereinbelow with reference to the annexed drawings, in which:

          figure 1 shows a cross-sectional view in lengthwise direction of a first embodiment of the  
10 invention;

          figure 2 shows a cross-sectional view along the line II-II of figure 1;

          figure 3 is a longitudinal section of a second embodiment of the invention;

15           figure 4 shows a detail view of the embodiment shown in figure 3 in a different position;

          figure 5 is a longitudinal section of a third embodiment of the present invention;

          figure 6 shows a view corresponding with figure  
20 5 of a fourth embodiment of the present invention;

          figure 7 shows a longitudinal section of a fifth embodiment of the present invention; and

          figure 8 is a longitudinal section of a sixth embodiment of the present invention.

25           Shown in figure 1 is a catalytic converter unit designated in its entirety with 1 and placed between a first exhaust section 2 and a second exhaust section 3. The catalytic converter unit is formed by a substrate 4, manufactured from for instance a ceramic material, in  
30 which are formed channels extending in longitudinal direction which are not shown in the drawing.

          The substrate is divided into a first section 5 and a second section 6 which are separated by a separating element in the form of a plate 7. A catalytic  
35 converter housing 8 in the form of a sleeve is arranged around catalytic converter substrate 4.

          Because catalytic converter housing 8 has a larger diameter than exhaust sections 2,3, a first, in

this case conical, connecting piece 9 is arranged between first exhaust section 2 and catalytic converter housing 8 and a second conical connecting piece 10 is arranged between second exhaust section 3 and catalytic converter housing 8. In the present case the conical connecting pieces are formed by conically deformed parts of the exhaust sections; it is possible to use other constructions for this purpose. Connection between catalytic converter housing 8 and both conical connecting pieces 9,10 takes place by means of a weld connection, as shown in the present figure, but it is also possible to make use of other types of connection, for instance a folded seam connection.

Arranged in first exhaust section 2 is a partition 11 whereby first exhaust section 2 is divided into two channels 12, 13. Supplied to these channels are flows originating from the cylinders, the ignition times of which are far removed from each other so as to prevent feedback of the gas flows. Separating plate 7 is arranged in the catalytic converter in order to also maintain this separation of the gas flows in the catalytic converter. It is of course quite possible to have partition 11 continue as far as the actual catalytic converter substrate 4, although this has the drawback that the ceramic catalytic converter substrate could quickly be destroyed in the case of possible mutual movement.

In some cases it is also important to maintain such a separation of gas flows after they have passed through the catalytic converter. For this purpose the separating plate 7 is extended on the side of the second exhaust section, to which it connects in a partition 14 arranged therein. This is however not important in all cases.

Figure 3 shows an embodiment wherein a mutual movement of the catalytic converter housing relative to both exhaust sections 2,3 is possible. For this purpose a shoulder 15 is formed on both sides of housing 8 in the form of a folded seam, wherein a sealing ring 16 is

arranged on the outer side of each of the shoulders. At the location of this shoulder 15 and this sealing ring 16 the first conical connecting piece 9 has a convex shape so that a good seal is obtained in diverse angular positions of first connecting piece 2 relative to catalytic converter unit 1. It is pointed out here that it is not necessary for the housing to extend as far as the convex conical part of first connecting piece 9; a gap 17 is left here. A similar construction is arranged on the other side of the catalytic converter unit.

In order to also ensure the separation between the gas flows as the angular position changes, the end of partition 11 is in this case provided with a thickened portion 18. As shown in figure 4, this thickened portion results in a good separation of the gas flows. This thickened portion can be formed by for instance a folded seam or an element fixed thereto in a different manner.

Figure 5 shows a third embodiment wherein, in order to compensate longitudinal expansion problems of the substrate of the catalytic converter, the substrate is divided in transverse direction into two sections so that, together with the other division, the catalytic converter is divided into four sections. Both sections are separated in longitudinal direction by an interspace 19. This space is available for absorbing expansion in longitudinal direction.

The substrate is further divided into two short sections by the division in transverse direction. This facilitates application by means of vapour deposition of the materials performing the catalytic function.

The embodiment of figure 6 also provides a somewhat resilient suspension of the sections of the catalytic converter substrate, in that the latter is received integrally in a spacer 20 taking for instance the form of a mat which is wrapped round the components of the catalytic converter. This mat is placed first in housing 8, whereafter the ends of the housing are seam-folded around spacer 20. This construction otherwise

corresponds with the third embodiment. It is possible and attractive to manufacture the mat from a ceramic web; it is however also possible to apply other materials such as glass fibre.

5                   A spacer 20 can also be applied in an embodiment wherein a mutual rotation is not taken into account. This is shown in figure 7.

                  In this embodiment the catalytic converter substrate is divided into only two sections which as in  
10 the first and second embodiment are separated by a separating plate 7 around which is wrapped a spacer 20. The thus created unit is placed in housing 8.

                  Finally, figure 8 shows an embodiment which corresponds with the third embodiment shown in figure 5,  
15 but wherein use is made of exhaust pipes with a double C-configuration, such as can for instance be applied in engines with five cylinders or a multiple thereof. Use is made herein of an internal channel and two C-shaped external channels. The separation between the external  
20 channels mutually and between the external channels and the internal channel is formed by a separating element 21. A corresponding separating element 22 is arranged in the catalytic converter substrate. Here also a thickened portion 23 is arranged, the function of which corresponds  
25 with that of thickened portion 18 in figure 5. In respect of the different shape of the separating element, the thickened portion is herein embodied in the form of a ring.

                  It will be apparent that, subject to the number  
30 of cylinders, any geometry can be applied.

                  It will be apparent that the diverse embodiments can be mutually combined.

                  In the embodiments according to figures 3, 4, 5, 6 and 8 the end surfaces of the catalytic converter  
35 elements have in each case a convex shape. This convex shape has the result that the channels in the middle of the catalytic converter - as seen in cross-section - are longer than at the periphery. The channels hereby have a

greater gas flow resistance in the middle than along the edge.

This effect forms at least a partial compensation for the fact that the density of the gas flow in the middle of the pipes is greater than at the edges. There thus results a more uniform distribution of the gas flow over the cross-section of the catalytic converter element.

It is otherwise possible to give the end surfaces a concave form. A reverse effect is then obtained. This can also be used to adapt the distribution of the gas flow.

With a combination of a concave and convex end wall the path length is balanced out again, so that the influence is neutral. The effects of the end surfaces can thus be used to influence the density of the gas flow.

## CLAIMS

1. Catalytic converter unit received between a  
5 first and a second exhaust section of an exhaust of an  
internal combustion engine, comprising:  
- a catalytic converter housing;  
- a catalytic converter element arranged in the  
catalytic converter housing;  
10 - a first connecting piece arranged between the  
first exhaust section and the catalytic converter  
housing; and  
- a second connecting piece arranged between  
the second exhaust section and the catalytic converter  
15 housing,

**characterized in that**

at least the first exhaust section comprises at  
least two channels which are separated by a first  
separating element,  
20 the catalytic converter element is divided in  
longitudinal direction into a number of parts  
corresponding with the number of channels, which parts  
are separated by at least a second separating element  
aligned relative to the first separating element.

25 2. Catalytic converter unit as claimed in claim  
1, **characterized in that** the first exhaust section  
comprises two channels of substantially equal cross-  
section, that the first separating element comprises a  
partition and that the second separating element  
30 comprises a plate separating two substantially identical  
parts of the catalytic converter element.

3. Catalytic converter unit as claimed in claim  
1, **characterized in that** the first exhaust section  
comprises an internal channel and two external channels  
35 of substantially C-shaped cross-section, wherein the  
cross-section of the C-shaped channels substantially  
equals double the cross-section of the internal channel,  
that the second separating element has a corresponding

cross-section and that the catalytic converter is divided into corresponding parts.

4. Catalytic converter unit as claimed in claim 1, 2 or 3, **characterized in that** a narrow gap is situated between the first separating element and the second separating element.

5. Catalytic converter unit as claimed in claim 1, 2 or 3, **characterized in that** the catalytic converter element is divided in transverse direction into at least two sections separated by an interspace and that the first separating element connects onto the second separating element.

6. Catalytic converter unit as claimed in any of the foregoing claims, **characterized in that** the catalytic converter element and the catalytic converter housing are separated by a spacer element extending around the catalytic converter unit.

7. Catalytic converter unit as claimed in claim 6, **characterized in that** the spacer element comprises a mat.

8. Catalytic converter unit as claimed in any of the foregoing claims, **characterized in that** rotation between the axis of the catalytic converter housing and the axis of at least the first exhaust section is possible on an axis extending transversely of one of these axes due to the connection between the first conical connecting piece and the catalytic converter housing, wherein the conical connecting piece on the outside of the catalytic converter housing is connected sealingly to the outside of the catalytic converter housing and wherein a gap is formed between the edge of the catalytic converter housing and the conical connecting piece.

9. Catalytic converter unit as claimed in claim 8, **characterized in that** a shoulder is formed on the outside of the catalytic converter housing, a sealing ring is arranged against the outside of the shoulder,

wherein the first conical connecting piece rests against the sealing ring.

10. Catalytic converter unit as claimed in claim 8 or 9, **characterized in that** the first or the second separating element is provided on its edges at the side of the other separating element with a thickened portion which mutually separates the channels in a position of the catalytic converter housing relative to the exhaust section which varies from the normal position.

11. Catalytic converter unit as claimed in claim 10, **characterized in that** the catalytic converter housing is seam-folded at its ends around the spacer element.



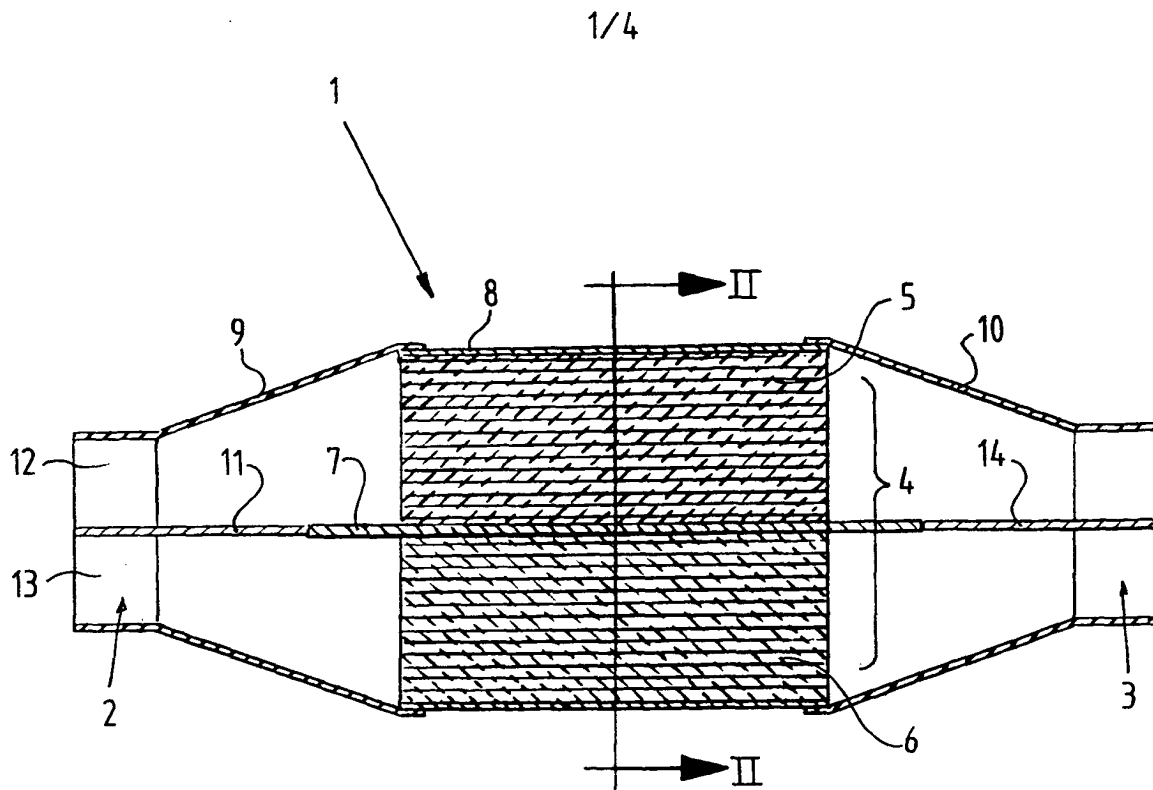


FIG. 1

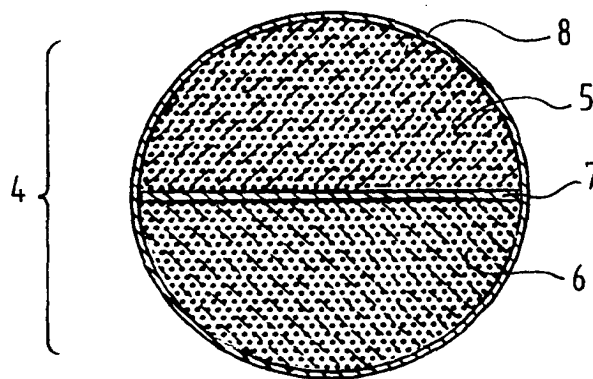


FIG. 2

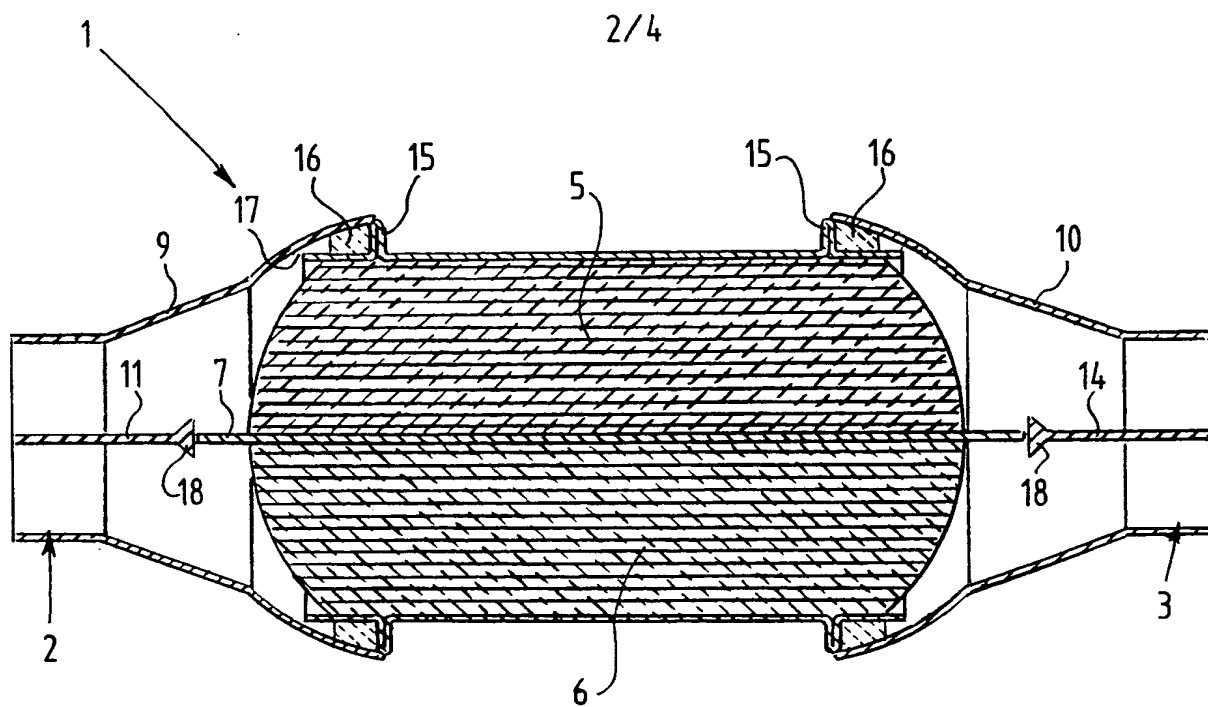


FIG. 3

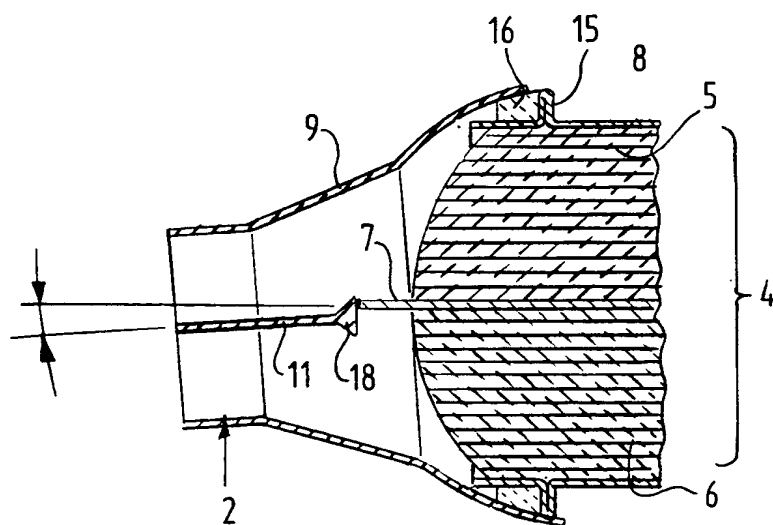


FIG. 4

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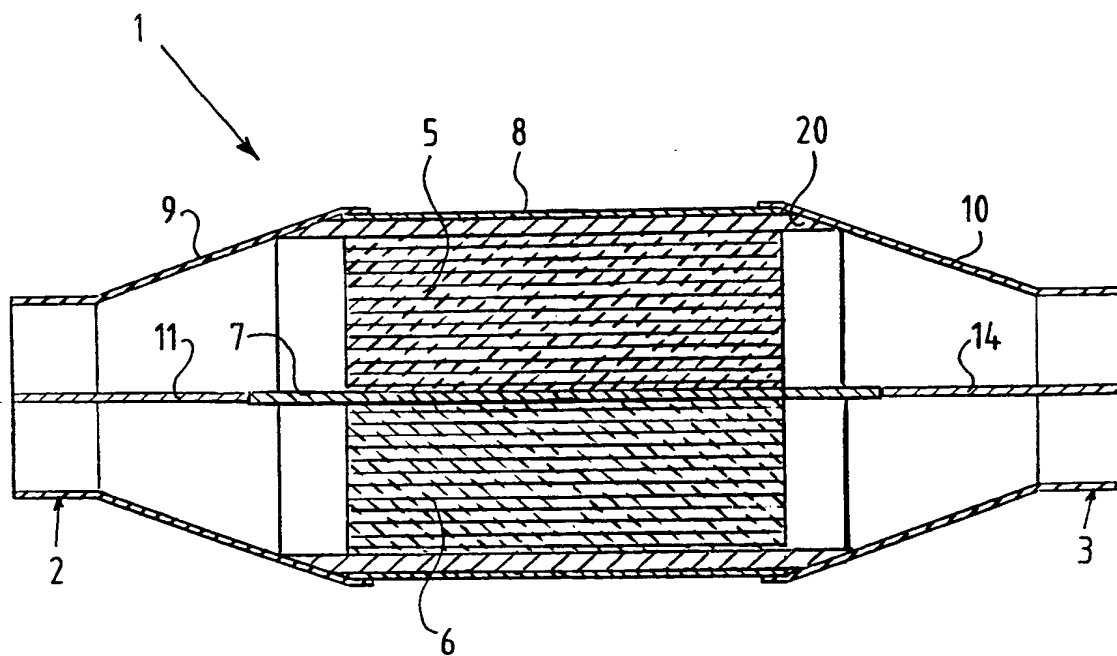


FIG. 7

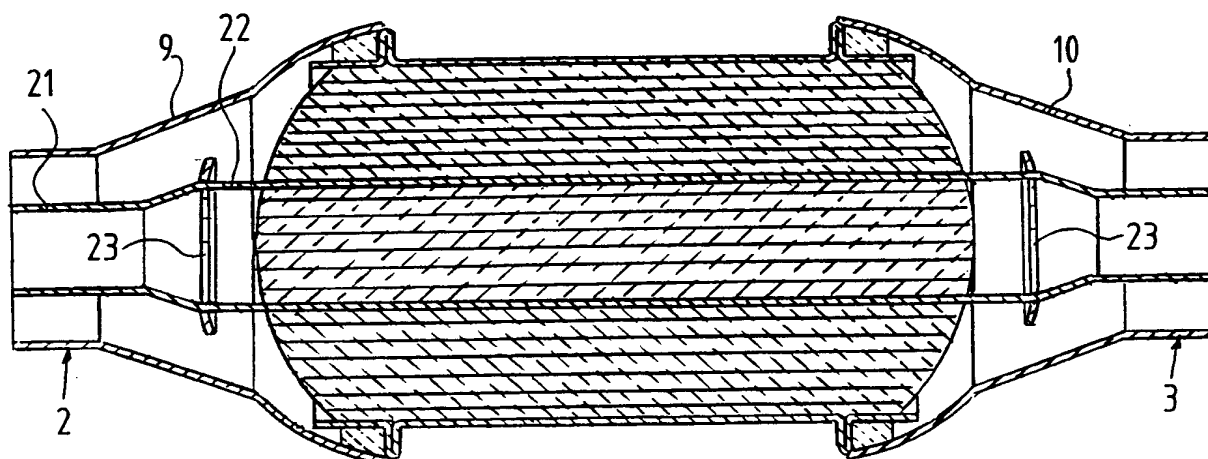


FIG. 8

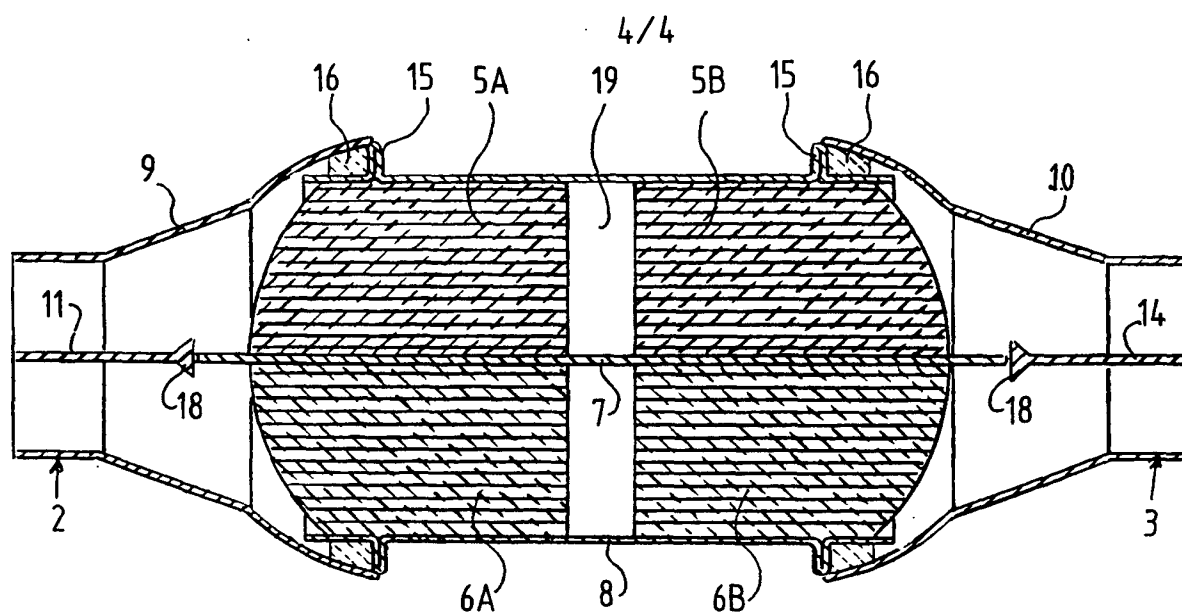


FIG. 5

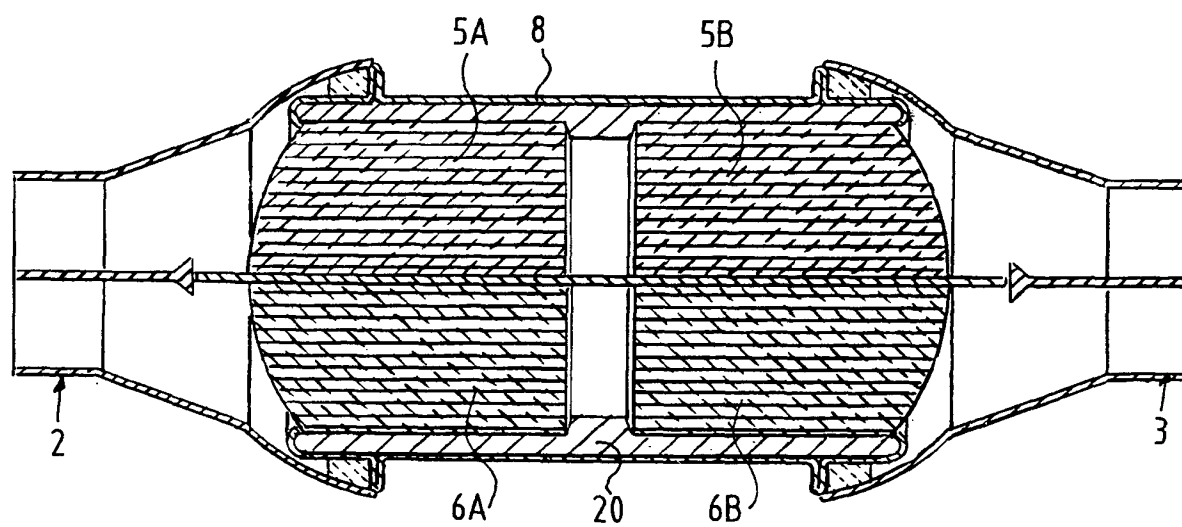


FIG. 6

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 99/00368

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 F01N3/28 F01N7/18

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 F01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 365 735 A (WEBER DAVID C ET AL) 22 November 1994 (1994-11-22) the whole document	1
A	PATENT ABSTRACTS OF JAPAN vol. 007, no. 257 (M-256), 16 November 1983 (1983-11-16) & JP 58 140432 A (NISSAN JIDOSHA KK), 20 August 1983 (1983-08-20) abstract	1
A	DE 90 03 268 U (ZEUNA-STÄRKER GMBH & CO KG) 13 June 1990 (1990-06-13) the whole document	1
A	US 5 758 493 A (ASIK JOSEPH R ET AL) 2 June 1998 (1998-06-02) figure 2	1
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

31 August 1999

Date of mailing of the international search report

06/09/1999

Name and mailing address of the ISA

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Authorized officer

Klinger, T

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 99/00368

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>GB 2 311 815 A (FORD MOTOR CO)  8 October 1997 (1997-10-08)  the whole document  -----</p>	8

# INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/NL 99/00368

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5365735 A	22-11-1994	JP 6167213 A	14-06-1994
JP 58140432 A	20-08-1983	NONE	
DE 9003268 U	13-06-1990	EP 0448054 A	25-09-1991
US 5758493 A	02-06-1998	NONE	
GB 2311815 A	08-10-1997	US 5701737 A	30-12-1997
		CA 2201202 A	01-10-1997
		DE 19712608 A	06-11-1997



# REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

## RECORD COPY

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International Application No.

NL99 / 368

14 JUN 1995  
International Filing Date

BUREAU VOOR DE INDUSTRIËLE EIGENDOM  
P.C.T. INTERNATIONAL APPLICATION  
Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference  
(if desired) (12 characters maximum) G PEM/MvZ/G5

### Box No. I TITLE OF INVENTION

Improved catalyser housing

### Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

GRAND PRIX SILENCERS B.V.  
Konstruktieweg 3. + 3a  
NL-6045 JD ROERMOND  
The Netherlands

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (that is, country) of nationality:  
The Netherlands (NL)

State (that is, country) of residence:  
The Netherlands (NL)

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

### Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

GROBBENHAAR, Hermanus Gerhardus  
Stationsweg 82d  
NL-6075 CD HERKENBOSCH  
The Netherlands

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:  
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The Netherlands

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

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### Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

☒ agent ☐ common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

EVELEENS MAARSE, Pieter  
ARNOLD & SIEDSMA  
Sweelinckplein 1  
NL-2517 GK THE HAGUE  
The Netherlands

Telephone No.

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The following designations are to be made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

## Regional Patent

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<b>Box No. VI PRIORITY CLAIM</b>		<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application: regional Office	international application: receiving Office
item (1) 23 June 1998 (23.06.1998)	1009468	NL		
item (2)				
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): (1)

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Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

ISA /

Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):

Date (day/month/year)  
17 March 1998  
(17.03.1998)

Number

SN 31485 NL

Country (or regional Office)

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#### Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following number of sheets:

request : 3  
description (excluding sequence listing part) : 8  
claims : 3  
abstract : 1  
drawings : 4  
sequence listing part of description :  
Total number of sheets : 19

This international application is accompanied by the item(s) marked below:

- ☒ fee calculation sheet
- ☐ separate signed power of attorney
- ☐ copy of general power of attorney; reference number, if any:
- ☐ statement explaining lack of signature
- ☒ priority document(s) identified in Box No. VI as item(s):
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Figure of the drawings which should accompany the abstract: 3

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Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

EVELEENS MAARSE, Pieter

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1. Date of actual receipt of the purported international application: 4 JUN 1998		<input checked="" type="checkbox"/> received:	
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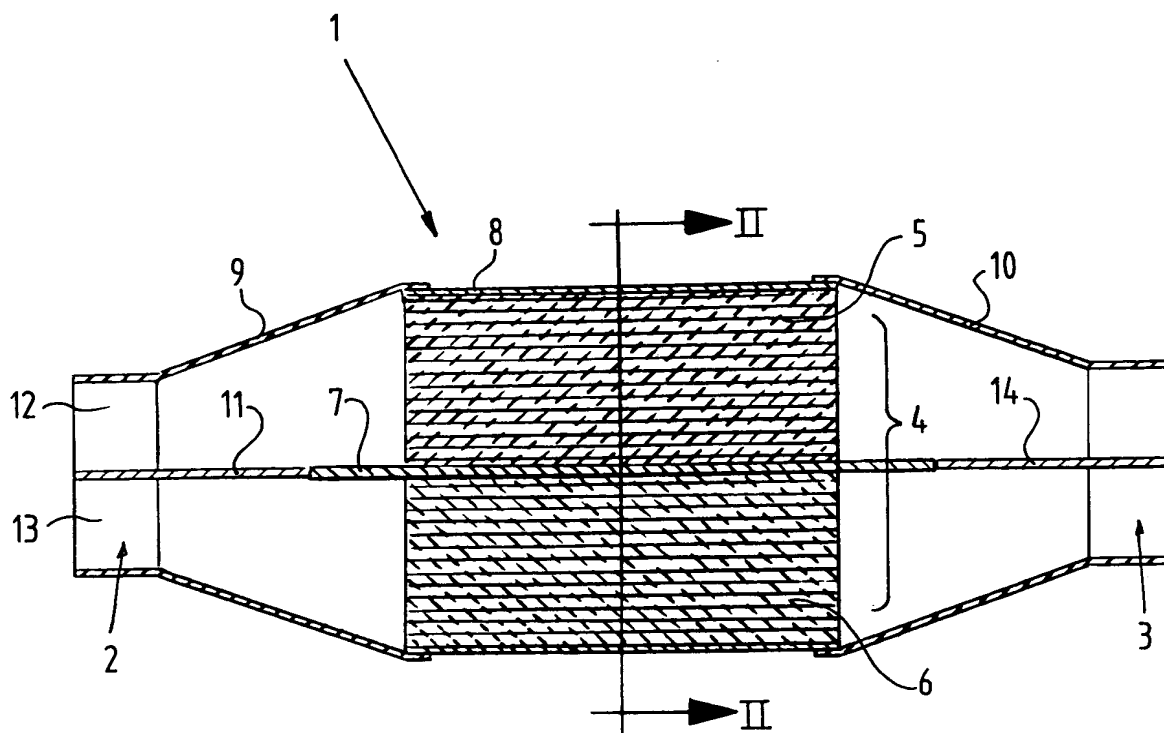


FIG. 1

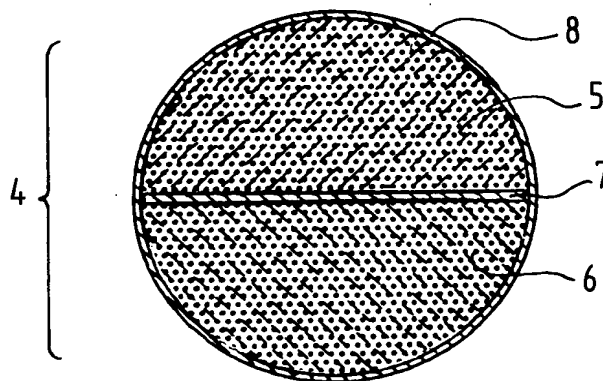


FIG. 2

2/4

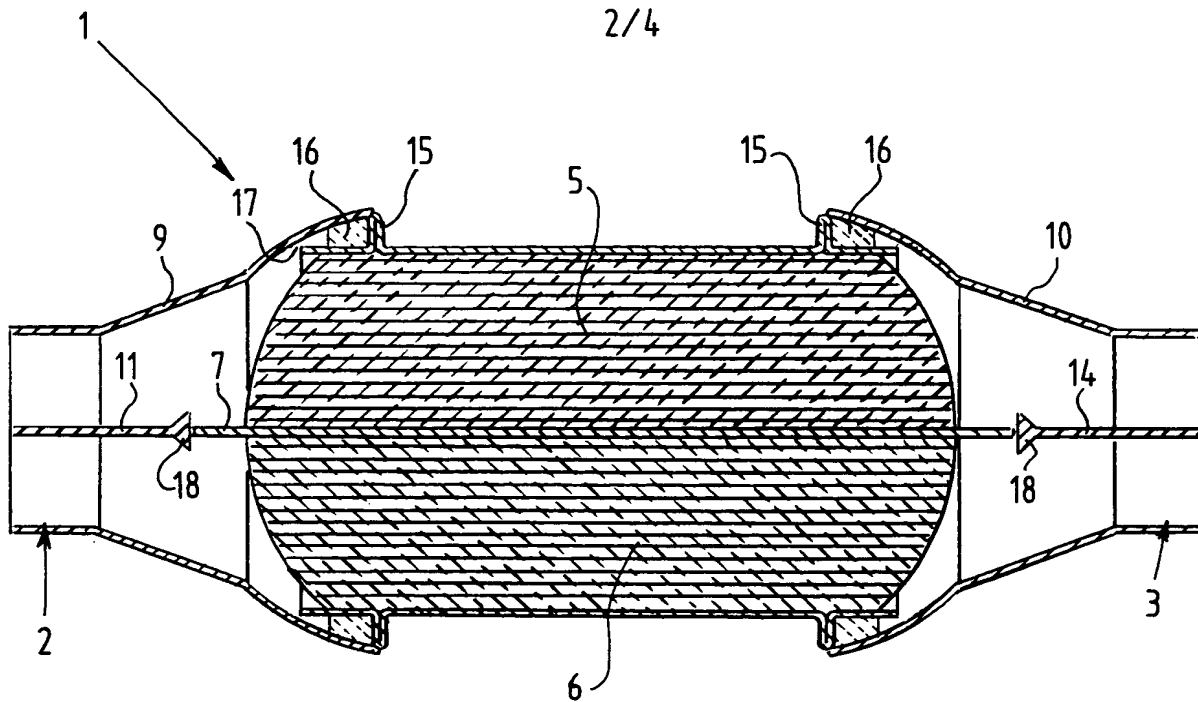


FIG. 3

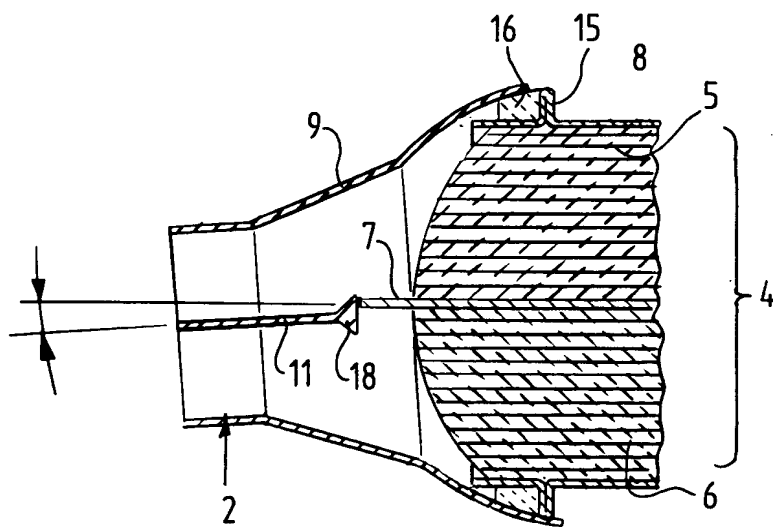


FIG. 4

3/4

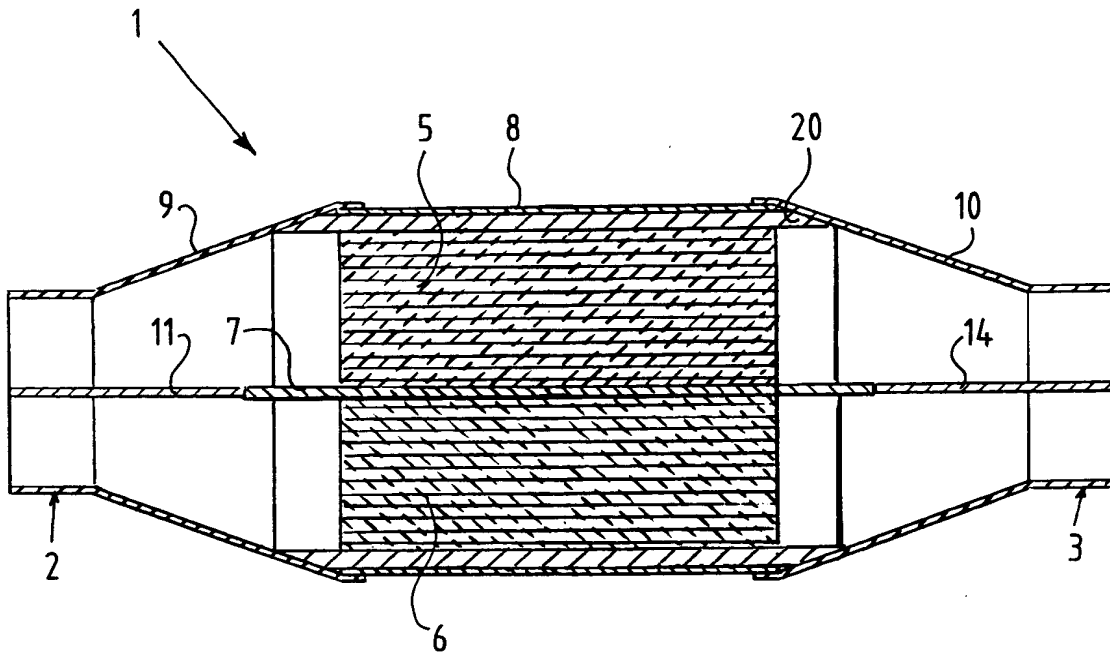


FIG. 7

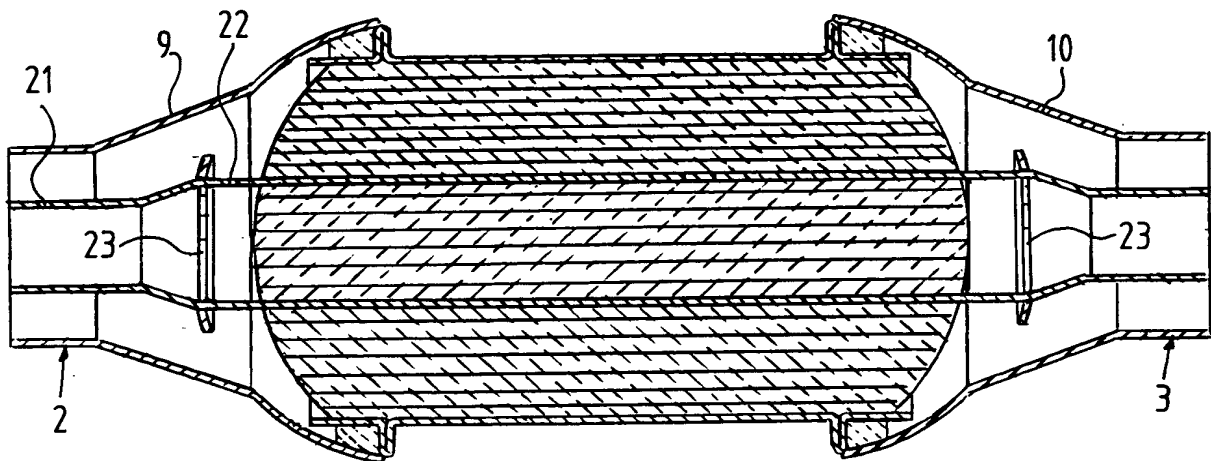


FIG. 8

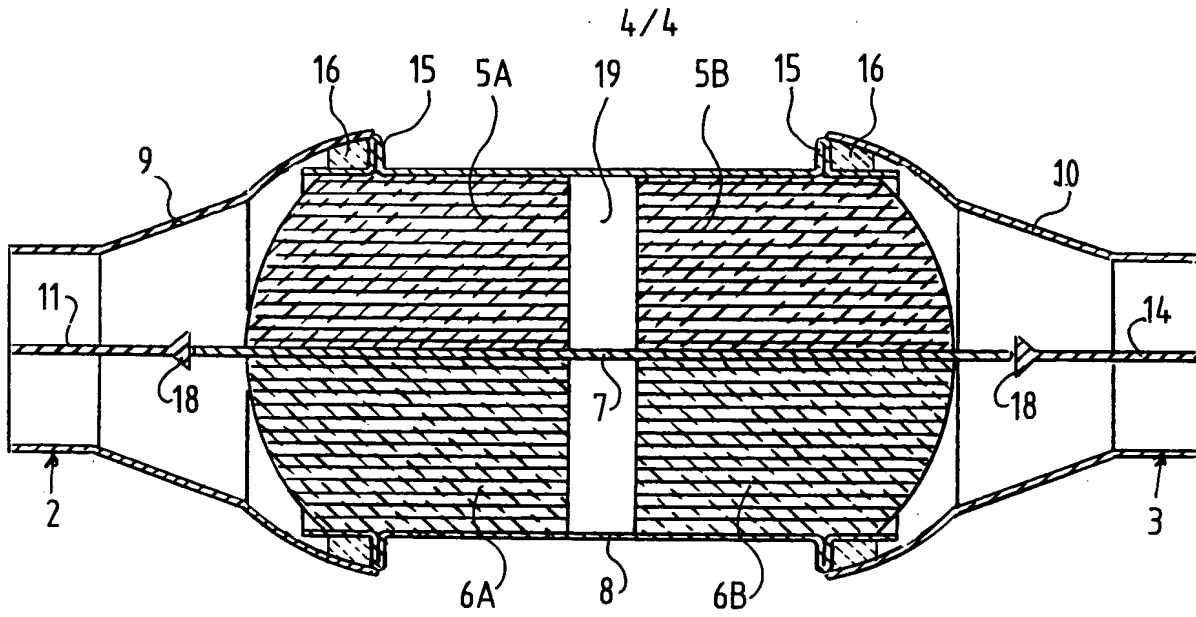


FIG. 5

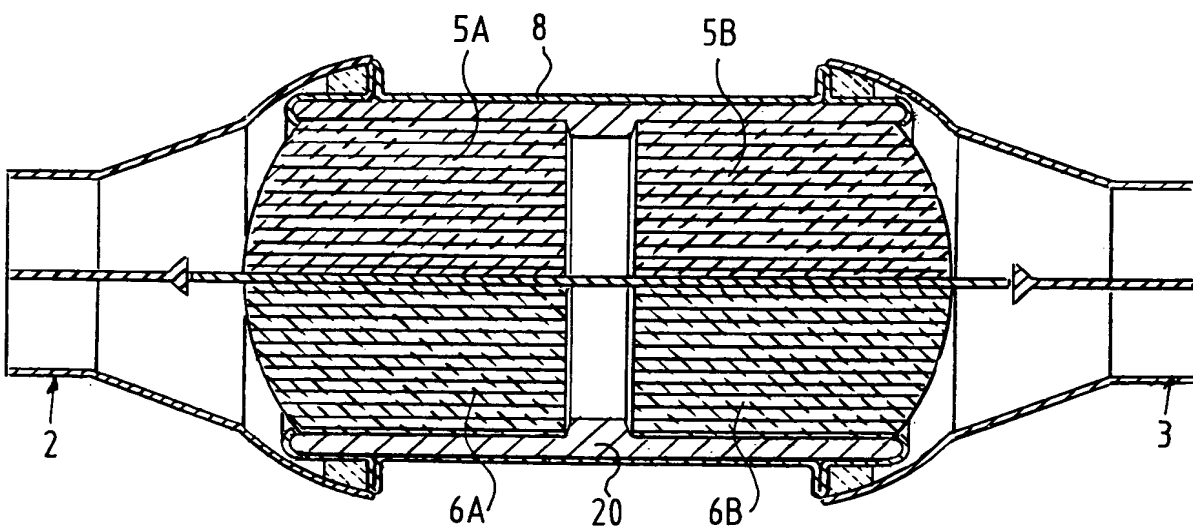


FIG. 6

G PEM/MvZ/G5

## VERBETERD KATALYSATORHUIS

De onderhavige uitvinding heeft betrekking op een tussen een eerste en een tweede uitlaatstuk van een uitlaat van een verbrandingsmotor opgenomen katalysatoreenheid, omvattende een katalysatorhuis, een in het  
5 katalysatorhuis opgenomen katalysatorelement; een tussen het eerste uitlaatstuk en het katalysatorhuis opgenomen eerste aansluitstuk; en een tussen het tweede uitlaatstuk en het katalysatorhuis opgenomen tweede aansluitstuk.

Dergelijke katalysatoreenheden zijn algemeen  
10 bekend. Thans wordt veelal als drager voor katalysatoreenheden gebruik gemaakt van een metaal, waarop de katalyserende stoffen zijn aangebracht. De drager is voorzien van zich in de lengterichting uitstrekkende kanaaltjes, aan de binnenzijde waarvan genoemde stoffen zijn aange-  
15 bracht.

Bij het streven naar het verhogen van de effectiviteit van dergelijke katalysatoreenheden is het van belang, dat de temperaturen van de verbrandingsgassen zo hoog mogelijk zijn; het is dan ook van belang, dat de  
20 katalysatoreenheden zo dicht mogelijk bij de motor worden geplaatst. Tevens is van belang dat de drager tegen hoge temperaturen bestand is. Hiertoe wordt gebruik gemaakt van een keramisch materiaal. Het keramische materiaal heeft echter de eigenschap dat het moeilijk maatvast te  
25 vervaardigen is, en dat het materiaal bros is, gemakkelijk breekt en een andere warmte-uitzettingscoëfficiënt heeft dan de bij deze techniek veelal toegepaste metalen.

Het doel van de onderhavige uitvinding is dan ook het verschaffen van een dergelijke katalysatoreen-  
30 heid, waarvan de constructie geschikt is voor toepassing van katalysatordragers van keramisch materiaal.

Dit doel wordt bereikt, doordat tenminste het eerste uitlaatstuk ten minste twee kanalen omvat die door een eerste scheidingselement worden gescheiden, dat het

katalysatorelement in de lengterichting in een met het aantal kanalen overeenkomend aantal delen is gedeeld, welke delen worden gescheiden door tenminste een in het verlengde van het eerste scheidingselement gelegen tweede  
5 scheidingselement.

Deze maatregelen maken het mogelijk ook bij uitlaatsystemen waarin afzonderlijke kanalen voor de toevoer van verschillende cilinders of van verschillende groepen cilinders afkomstige uitlaatgassen gescheiden toe  
10 te voeren aan de katalysator. De toepassing van een dergelijk scheidingselement vermijdt dat het katalysatorelement vernield wordt bij eventuele temperatuurspanningen. De bij dergelijke gescheiden kanalen toegepaste tussenschotten zouden immers een dergelijke keramisch  
15 katalysatorelement stuk kunnen drukken.

Alhoewel, zoals hierboven vermeld is, de uitvinding voornamelijk van toepassing is bij keramische drogers van katalysatoren, is zij hiertoe niet beperkt; zij is evenzeer van toepassing bij anderssoortige kataly-  
20 satoren, bijvoorbeeld metalen, of in de toekomst wellicht kunststoffen dragers.

Zoals in de conclusies 2 en 3 genoemd is, is deze maatregel bij diverse configuraties mogelijk. De toepassing van een spleet tussen het eerste scheidings-  
25 element en het tweede scheidingselement leidt tot een verbeterde bescherming van de katalysator bij eventuele temperatuuruitzettingen.

Dit voordeel wordt nog vergroot wanneer het katalysatorelement in de dwarsrichting in ten minste twee  
30 stukken is gedeeld die door een tussenruimte worden gescheiden en het eerste scheidingselement aansluit op het tweede scheidingselement.

Ook de maatregel dat het katalysatorelement en het katalysatorhuis worden gescheiden door een zich  
35 rondom de katalysatoreenheid uitstrekkend afstandselement biedt bescherming voor de katalysatoreenheid wanneer deze zich zou uitstrekken in radiale richting.



Zoals gesteld is, is het van belang dat de katalysatoreenheid zo dicht mogelijk bij de motor wordt geplaatst in verband met de dan hogere temperatuur van de uitlaatgassen. Bij het starten van de motor wordt de katalysator dan eerder effectief. In verband met het trillen van de motor is het van belang, dat rotatie tussen de as van het katalysatorhuis en de as van tenminste het eerste uitlaatstuk om een as, die zich dwars op één van deze assen uitstrekt, mogelijk is door de aansluiting tussen het eerste conische aansluitstuk en het katalysatorhuis, waarbij het conische aansluitstuk aan de buitenzijde van het katalysatorhuis afdichtend is verbonden met de buitenzijde van het katalysatorhuis en waarbij tussen de rand van het katalysatorhuis en het conische aansluitstuk een spleet is gevormd.

Volgens een bijzondere uitvoeringsvorm hiervan is aan de buitenzijde van het katalysatorhuis een borst gevormd, waarbij een afdichtring tegen de buitenzijde van de borst is aangebracht, en het eerste conische aansluitstuk tegen de afdichtring rust. Het is een constructief bijzonder aantrekkelijke uitvoeringsvorm. Door genoemde spleet is het mogelijk dat niet alleen een rotatie mogelijk is, maar dat tevens axiale verplaatsingen van de elementen onderling mogelijk zijn zonder dat vernieling van de katalysatordrager optreedt.

Volgens een andere voorkeursuitvoeringsvorm is het eerste of het tweede scheidingselement aan zijn randen aan de zijde van het andere scheidingselement van een verdikking voorzien die bij een van de normale stand van het katalysatorhuis ten opzichte van het uitlaatstuk afwijkende stand de kanalen van elkaar scheidt.

Het zal duidelijk zijn dat dit voorziet in situaties waarin rotatie van de diverse onderdelen ontstaat, en waarbij desondanks de kanalen van elkaar scheidt.

Ook de uitvoeringsvorm, waarbij het katalysatorhuis aan zijn einden rondom het afstandselement ge-

felst is, leidt tot een aantrekkelijke, stevige constructie.

Vervolgens zal de onderhavige uitvinding worden toegelicht aan de hand van bijgaande tekeningen, waarin  
5 voorstellen:

figuur 1 een doorsnede-aanzicht in de lengterichting van een eerste uitvoeringsvorm van de uitvinding;

figuur 2 een dwarsdoorsnede-aanzicht volgens de  
10 lijn II-II van figuur 1;

figuur 3 een lengtedoorsnede-aanzicht van een tweede uitvoeringsvorm van de uitvinding;

figuur 4 een detailaanzicht van in figuur 3 getoonde uitvoeringsvorm in een andere positie;

15 figuur 5 een lengtedoorsnede-aanzicht van een derde uitvoeringsvorm van de onderhavige uitvinding;

figuur 6 een met figuur 5 overeenkomend aanzicht van een vierde uitvoeringsvorm van de onderhavige uitvinding;

20 figuur 7 een lengtedoorsnede-aanzicht van een vijfde uitvoeringsvorm van de onderhavige uitvinding; en

figuur 8 een lengtedoorsnede-aanzicht van een zesde uitvoeringsvorm van de onderhavige uitvinding.

In figuur 1 is een in zijn geheel met 1 aangeduide katalysatoreenheid getoond die geplaatst is tussen  
25 een eerste uitlaatstuk 2 en een tweede uitlaatstuk 3. De katalysatoreenheid wordt gevormd door een bijvoorbeeld van keramisch materiaal vervaardigde drager 4, waarin zich in de lengterichting uitstreckende kanaaltjes zijn  
30 gevormd die in de tekening niet zijn weergegeven.

De drager wordt verdeeld in een eerste stuk 5 en een tweede stuk 6 die zijn gescheiden door een scheidings-element in de vorm van een plaat 7. Rondom de katalysator drager 4 is een katalysatorhuis 8 aangebracht in  
35 de vorm van een bus.

Omdat het katalysatorhuis 8 een grotere diameter heeft dan de uitlaatstukken 2,3, wordt tussen het eerste uitlaatstuk 2 en het katalysatorhuis 8 een eerste,

in dit geval conisch aansluitstuk 9 aangebracht, en is  
tussen het tweede uitlaatstuk 3 en het katalysatorhuis 8  
een tweede conisch aansluitstuk 10 aangebracht. In het  
onderhavige geval zijn de conische aansluitstukken ge-  
5 vormd door conisch vervormde delen van de uitlaatstukken;  
het is mogelijk hiervoor andere constructies toe te  
passen. Verbinding tussen het katalysatorhuis 8 en beide  
conische aansluitstukken 9,10 vindt plaats door middel  
van een lasverbinding, zoals in de onderhavige figuur  
10 getoond is, maar het is tevens mogelijk van andere soor-  
ten verbindingen gebruik te maken, bijvoorbeeld van een  
felsverbinding.

In het eerste uitlaatstuk 2 is een tussenschot  
11 aangebracht, waardoor het eerste uitlaatstuk 2 ver-  
15 deeld wordt in twee kanalen 12, 13. Aan deze kanalen  
worden stromen toegevoerd die van cilinders afkomstig  
zijn, waarvan de ontstekingstijdstippen ver van elkaar  
zijn verwijderd om terugkoppeling van de gasstromen te  
voorkomen. Om deze scheiding van de gasstromen ook te  
20 handhaven in de katalysator is in de katalysator de  
scheidingsplaat 7 aangebracht. Het is uiteraard wel  
mogelijk schot 11 te laten doorlopen tot aan de eigenlij-  
ke katalysatordrager 4, doch dit heeft het nadeel dat bij  
eventuele onderlinge bewegingen de keramische conden-  
25 satordrager snel zou kunnen worden vernield.

In sommige gevallen is het ook van belang een  
dergelijke scheiding van de gasstromen te handhaven na  
het passeren van de katalysator. Hiertoe is tevens de  
scheidingsplaat 7 verlengd aan de zijde van het tweede  
30 uitlaatstuk, waarop deze aansluit in een daarin aange-  
bracht scheidingsschot 14. Dit is echter niet in alle  
gevallen van belang.

In figuur 3 is een uitvoeringsvorm getoond,  
waarbij een onderlinge beweging van het katalysatorhuis  
35 ten opzichte van de beide uitlaatstukken 2,3 mogelijk is.  
Hiertoe is aan beide zijden van het huis 8 een borst 15  
gevormd in de vorm van een felsnaad, waarbij aan de  
buitenzijde van elk van de borsten een afdichtende ring

16 is aangebracht. Ter plaatse van deze borst 15 en deze afdichtring 16 is het eerste conische aansluitstuk 9 bolvormig gevormd, zodat bij diverse hoekposities van het eerste aansluitstuk 2 ten opzichte van de katalysatoreenheid 1 een goede afdichting wordt verkregen. Hierbij wordt er op gewezen dat het niet noodzakelijk is dat het huis zich uitstrekt tot aan het bolvormig conische deel van het eerste aansluitstuk 9; hierbij blijft een spleet 17 over. Aan de andere zijde van de katalysatoreenheid is 10 een overeenkomstige constructie aangebracht.

Om ook bij veranderende hoekpositie de scheiding tussen de gasstromen te waarborgen, is in dit geval het einde van het scheidingsschot 11 van een verdikking 18 voorzien. Zoals in figuur 4 zichtbaar is, leidt deze 15 verdikking tot een goede scheiding van de gasstromen. Deze verdikking kan worden gevormd door bijvoorbeeld een felsnaad of een op een andere wijze daaraan bevestigd element.

Figuur 5 toont een derde uitvoeringsvorm, 20 waarbij, om lengte-uitzettingsproblemen van de drager van de katalysator te compenseren door de drager van de katalysator in de dwarsrichting te verdelen in twee stukken, zodat, tezamen met de andere verdeling de katalysator in vier stukken is verdeeld. Beide stukken worden 25 in de lengterichting gescheiden door een tussenruimte 19. Deze ruimte is beschikbaar om uitzetting in de lengerichting op te vangen.

Verder wordt door de verdeling in de dwarsrichting het substraat in twee korte stukken gedeeld. Dit 30 vergemakkelijkt het aanbrengen van de katalysatorfunctie uitoefenende stoffen door middel van opdampen.

De uitvoeringsvorm van figuur 6 voorziet ook in een enigszins verende ophanging van de stukken van de katalysatordrager, doordat deze in zijn geheel is opgenomen in een afstandshouder 20 die bijvoorbeeld de vorm 35 heeft van een mat die om de onderdelen van de katalysator zijn gewikkeld. Deze mat wordt aanvankelijk in het huis 8 geplaatst, waarna de einden van het huis rondom de af-

standshouder 20 worden gefelst. Overigens komt deze constructie overeen met de derde uitvoeringsvorm. Het is mogelijk en aantrekkelijk de mat van een keramisch weefsel te vervaardigen; het is echter tevens mogelijk andere materialen toe te passen, zoals glasvezel.

Ook in een uitvoeringsvorm, waarbij geen rekening is gehouden met een onderlinge verdraaiing kan een afstandshouder 20 worden toegepast. Dit is afgebeeld in figuur 7.

10 Bij deze uitvoeringsvorm is de katalysatordrager slechts in twee stukken verdeeld die evenals bij de eerste en de tweede uitvoeringsvorm gescheiden worden door een scheidingsplaat 7, waaromheen een afstandshouder 20 is gewikkeld. Het aldus ontstane geheel is in het huis 15 8 geplaatst.

In figuur 8 is tenslotte een uitvoeringsvorm getekend, die overeenkomt met de in figuur 5 getoonde derde uitvoeringsvorm, doch waarbij gebruik gemaakt is van uitlaatpijpen met een dubbele C-configuratie, zoals 20 bijvoorbeeld toepasbaar is bij motoren met vijf, of een veelvoud daarvan, cilinders. Hierbij wordt gebruik gemaakt van een inwendig kanaal en twee C-vormige uitwendige kanalen. De scheiding tussen de uitwendige kanalen onderling en tussen de uitwendige kanalen en het inwendige kanaal wordt gevormd door een scheidingselement 21. In 25 de katalysatordrager is een overeenkomstig scheidingselement 22 aangebracht. Ook hier is een verdikking 23 aangebracht, waarvan de functie overeenkomt met de verdikking 18 in figuur 5. In verband met de andere vorm van het 30 scheidingselement is hierbij de verdikking uitgevoerd in de vorm van een ring.

Het zal duidelijk zijn dat in afhankelijkheid van het aantal cilinders elke geometrie kan worden toegepast.

35 Het zal duidelijk zijn, dat de diverse uitvoeringsvormen onderling kunnen worden gecombineerd.

Bij de uitvoeringsvormen volgens de figuren 3,

4, 5, 6 en 8 is steeds sprake van bol gevormde kopvlakken van de katalysatorelementen. Deze bolvorm heeft het gevolg dat - volgens de dwarsdoorsnede gezien - de kanalen in het midden van de katalysator langer zijn dan aan de omtrek. Hierdoor hebben de kanalen in het midden een grotere gasstromingsweerstand dan langs de rand.

Dit effect vormt tenminste een gedeeltelijke compensatie van het feit dat de dichtheid van de gasstroom in het midden van de pijpen groter is dan aan de randen. Aldus ontstaat een gelijkmatigere verdeling van de gasstroom over de doorsnede van het katalysatorelement.

Het is overigens mogelijk de kopvlakken hol uit te voeren. Er wordt dan een omgekeerd effect verkregen. Ook dit kan worden gebruikt voor het aanpassen van de verdeling van de gasstroom.

Door combinatie van een holle en een bolle kopwand wordt de weglengte weer vereffend, zodat de invloed neutraal is. De effecten van een kopvlakken kunnen dus worden gebruikt voor het beïnvloeden van de dichtheid van de gasstroom.

## CONCLUSIES

1. Tussen een eerste en een tweede uitlaatstuk van een uitlaat van een verbrandingsmotor opgenomen katalysatoreenheid, omvattende:

- een katalysatorhuis;
- 5       - een in het katalysatorhuis opgenomen katalysatorelement;
- een tussen het eerste uitlaatstuk en het katalysatorhuis opgenomen eerste aansluitstuk; en
- een tussen het tweede uitlaatstuk en het
- 10 katalysatorhuis opgenomen tweede aansluitstuk,  
**met het kenmerk,**  
dat tenminste het eerste uitlaatstuk tenminste twee kanalen omvat, die door een eerste scheidingselement worden gescheiden,
- 15       dat het katalysatorelement in de lengterichting in een met het aantal kanalen overeenkomend aantal delen is gedeeld, welke delen worden gescheiden door tenminste een in het verlengde van het eerste scheidingselement gelegen tweede scheidingselement.

- 20       2. Katalysatoreenheid volgens conclusie 1, **met het kenmerk**, dat het eerste uitlaatstuk twee kanalen met hoofdzakelijk gelijke doorsnede omvat, dat het eerste scheidingselement een schot omvat, en dat het tweede scheidingselement een plaat omvat die twee hoofdzakelijk
- 25 gelijke delen van het katalysatorelement scheidt.

3. Katalysatoreenheid volgens conclusie 1, **met het kenmerk**, dat het eerste uitlaatstuk een inwendig kanaal en twee uitwendige kanalen met een hoofdzakelijk C-vormige doorsnede omvat, waarbij de doorsnede van de C-
- 30 vormige kanalen hoofdzakelijk gelijk is aan het dubbele van de doorsnede van het inwendige kanaal, dat het tweede scheidingselement een overeenkomstige dwarsdoorsnede heeft, en dat de katalysator in overeenkomstige stukken is verdeeld.

4. Katalysatoreenheid volgens conclusie 1, 2 of 3, **met het kenmerk**, dat tussen het eerste scheidingselement en het tweede scheidingselement een smalle spleet is gelegen.

5 5. Katalysatoreenheid volgens conclusie 1,2 of 3, **met het kenmerk**, dat het katalysatorelement in de dwarsrichting in ten minste twee stukken is gedeeld die door een tussenruimte worden gescheiden, en dat het eerste scheidingselement aansluit op het tweede schei-  
10 dingselement.

6. Katalysatoreenheid volgens een van de voorafgaande conclusies, **met het kenmerk**, dat het katalysatorelement en het katalysatorhuis worden gescheiden door een zich rondom de katalysatoreenheid uitstrekkend af-  
15 standselement.

7. Katalysatoreenheid volgens conclusie 6, **met het kenmerk**, dat het afstandselement een mat omvat.

8. Katalysatoreenheid volgens een van de voorafgaande conclusies, **met het kenmerk**, dat rotatie tussen  
20 de as van het katalysatorhuis en de as van tenminste het eerste uitlaatstuk, om een as, die zich dwars op een van deze assen uitstrekt, mogelijk is door de aansluiting tussen het eerste conische aansluitstuk en het katalysatorhuis, waarbij het conische aansluitstuk aan de buiten-  
25 zijde van het katalysatorhuis afdichtend is verbonden met de buitenzijde van het katalysatorhuis en waarbij tussen de rand van het katalysatorhuis en het conische aansluitstuk een spleet is gevormd.

9. Katalysatoreenheid volgens conclusie 8, **met**  
30 **het kenmerk**, dat aan de buitenzijde van het katalysatorhuis een borst is gevormd, een afdichtring tegen de buitenzijde van de borst is aangebracht, waarbij het eerste conische aansluitstuk tegen de afdichtring rust.

10. Katalysatoreenheid volgens conclusie 8 of  
35 9, **met het kenmerk**, dat het eerste of het tweede scheidingselement de aan zijn randen aan de zijde van het andere scheidingselement van een verdikking is voorzien, die bij een van de normale stand van het katalysatorhuis



ten opzichte van het uitlaatstuk afwijkende stand de  
kanalen van elkaar scheidt.

11. Katalysatoreenheid volgens conclusie 10,  
**met het kenmerk**, dat het katalysatorhuis aan zijn einden  
5 rondom het afstandselement is gefelst.

**UITTREKSEL**

De uitvinding betreft een tussen een eerste en een tweede uitlaatstuk van een uitlaat van een verbrandingsmotor opgenomen katalysatoreenheid, omvattende: een katalysatorhuis; een in het katalysatorhuis opgenomen katalysatorelement; een tussen het eerste uitlaatstuk en  
5 het katalysatorhuis opgenomen eerste aansluitstuk; en een tussen het tweede uitlaatstuk en het katalysatorhuis opgenomen tweede aansluitstuk, waarbij tenminste het eerste uitlaatstuk tenminste twee kanalen omvat, die door een eerste scheidingselement worden gescheiden, en waar-  
10 bij het katalysatorelement in de lengterichting in een met het aantal kanalen overeenkomend aantal delen is gedeeld, welke delen worden gescheiden door tenminste een in het verlengde van het eerste scheidingselement gelegen tweede scheidingselement.

15 Deze maatregelen maken het mogelijk ook bij uitlaatsystemen waarin afzonderlijke kanalen voor de toevoer van verschillende cilinders of van verschillende groepen cilinders afkomstige uitlaatgassen gescheiden toe te voeren aan de katalysator. De toepassing van een  
20 dergelijk scheidingselement vermijdt dat het katalysatorelement vernield wordt bij eventuele temperatuurspanningen. De bij dergelijke gescheiden kanalen toegepaste tussenschotten zouden immers een dergelijke keramisch katalysatorelement stuk kunnen drukken.

25

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 99/00368

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 F01N3/28 F01N7/18

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 F01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 365 735 A (WEBER DAVID C ET AL) 22 November 1994 (1994-11-22) the whole document	1
A	--- PATENT ABSTRACTS OF JAPAN vol. 007, no. 257 (M-256), 16 November 1983 (1983-11-16) & JP 58 140432 A (NISSAN JIDOSHA KK), 20 August 1983 (1983-08-20) abstract	1
A	--- DE 90 03 268 U (ZEUNA-STÄRKER GMBH & CO KG) 13 June 1990 (1990-06-13) the whole document	1
A	--- US 5 758 493 A (ASIK JOSEPH R ET AL) 2 June 1998 (1998-06-02) figure 2	1
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Klinger, T

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 99/00368

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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